Calculus 1 Workbook

Graphing functions

krista king MATH

EQUATION MODELING

1. A car and a truck were driven for a week. The car traveled 75 miles more than the truck. Each vehicle had different fuel mileage. Write an equation using t (where t is the number of miles the truck traveled) to calculate the number of gallons g, used during the week.

	Car	Truck
Mileage	28 mpg	17 mpg
Distance	c miles	t miles

2. A motorcycle and a car were driven for a month. The motorcycle traveled 120 miles more than the car. Each vehicle had different fuel mileage. Write an equation using m (where m is the number of miles the motorcycle traveled) to calculate the number of gallons g, used during the month.

	Motorcycle	Car
Mileage	33 mpg	22 mpg
Distance	m miles	c miles

3. A baseball is thrown at a speed of 21 ft/s straight down from a high platform. The distance it travels can be calculated using $D = 16t^2 + 21t$, where t is the amount of time in seconds that it's been falling. The average

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speed of any object can be calculated using $V = D/t$. Write an equation giving the time of the fall in terms of V.

4. A rock is thrown at a speed of 8 ft/s straight down from a high platform. The distance it travels can be calculated using $D = 16^2 + 8t$, where t is the amount of time in seconds that it's been falling. The average speed of any object can be calculated using $V = D/t$. Write an equation giving the time of the fall in terms of V.

5. Each employee at the manager level of a company is paid $\$45{,}000$. The owner of the company wants to divide $\$162{,}000$ evenly among the managers over the course of a year. Write an expression, in terms of the number of mangers m, that gives the amount a each employee earns per month.

6. Each employee at the manager level in a company is paid $\$37{,}800$. The owner of the company wants to divide $\$102{,}000$ evenly among the managers over the course of a year. Write an expression, in terms of the number of mangers m, that gives the amount a each employee earns per month.

7. The Jones and Anderson family go on vacation together with each family driving in their own car. The Anderson family travels 50 miles further

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than the Jones family. Each family averages 65 mph on the trip. Write an equation using D_a (where D_a is the total miles the Anderson family drove) to calculate the total time T both families spent driving to their destination.

	Jones	Anderson
Distance	D_j miles	D_a miles
Rate	65 mph	65 mph
Time	T_j hours	T_a hours

8. The Frank and Harrington family go on vacation together with each family driving in their own car. The Frank family travels 120 miles less than the Harrington family. Each family averages 50 mph on the trip. Write an equation using D_f (where D_f is the total miles the Frank family drove) to calculate the total time T both families spent driving to their destination.

	Frank	Harrington
Distance	D_f miles	D_h miles
Rate	50 mph	50 mph
Time	T_f hours	T_h hours

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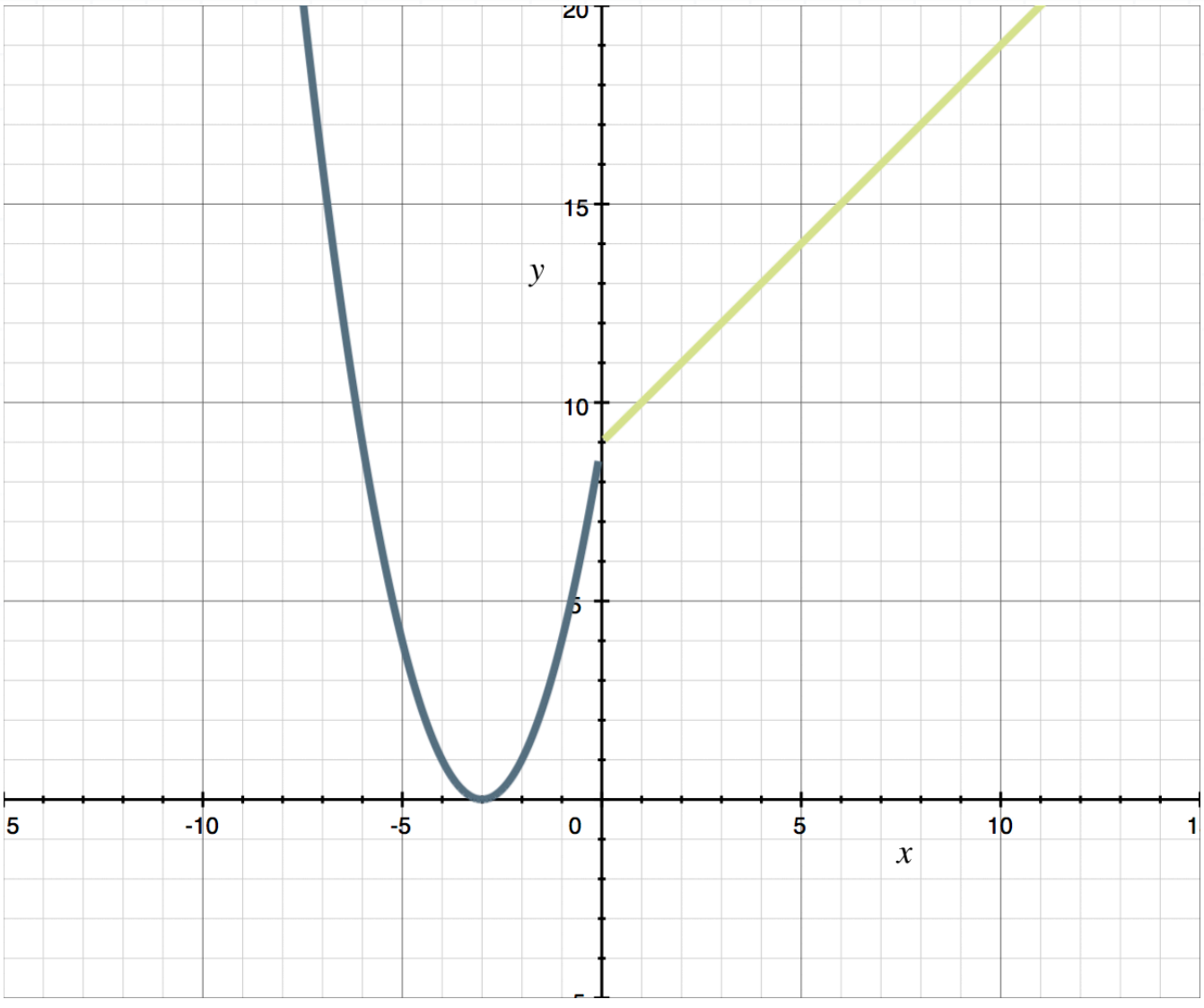
MODELING A PIECEWISE-DEFINED FUNCTION

1. Find the equation of the piecewise function.



2. Find the equation of the piecewise function.

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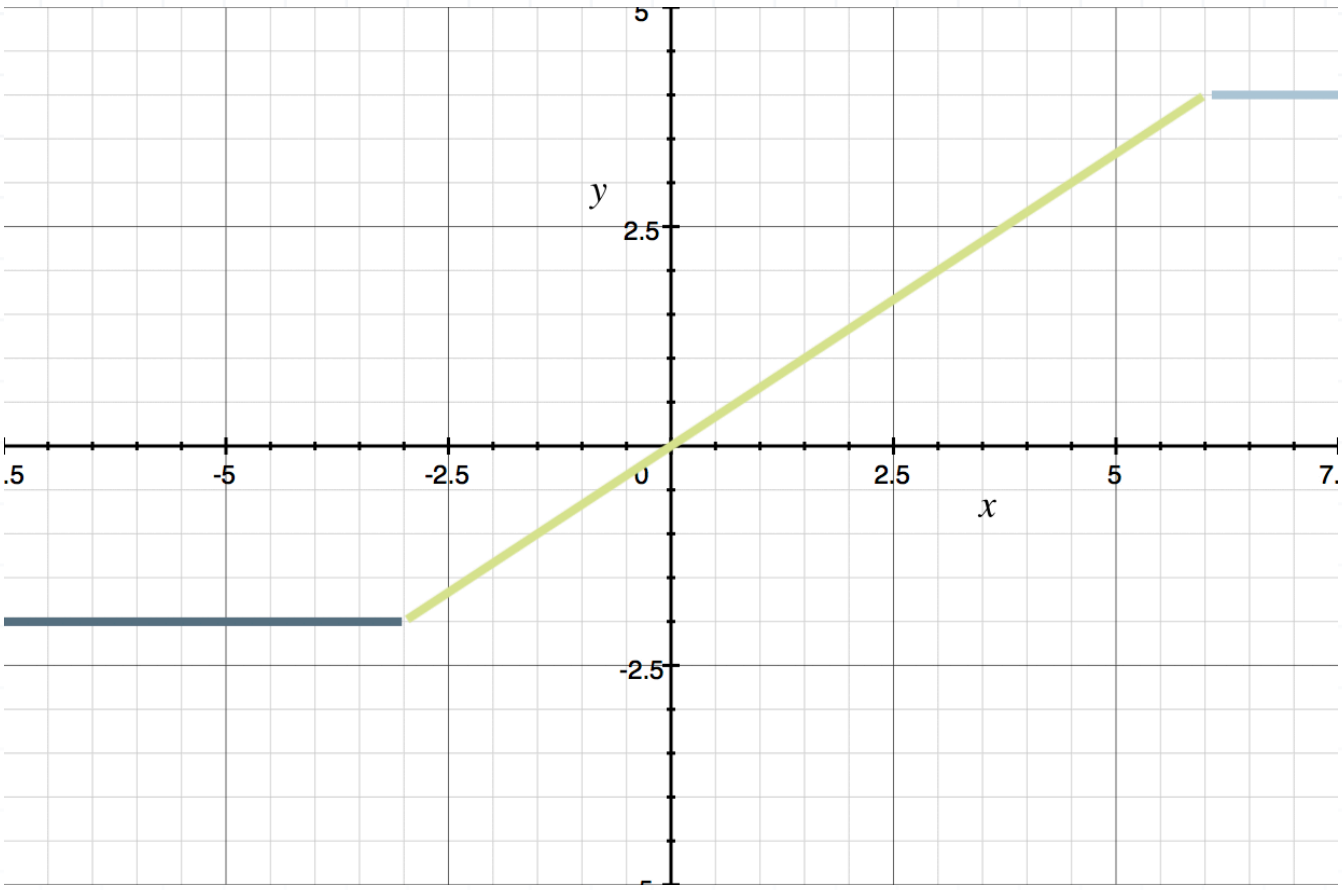
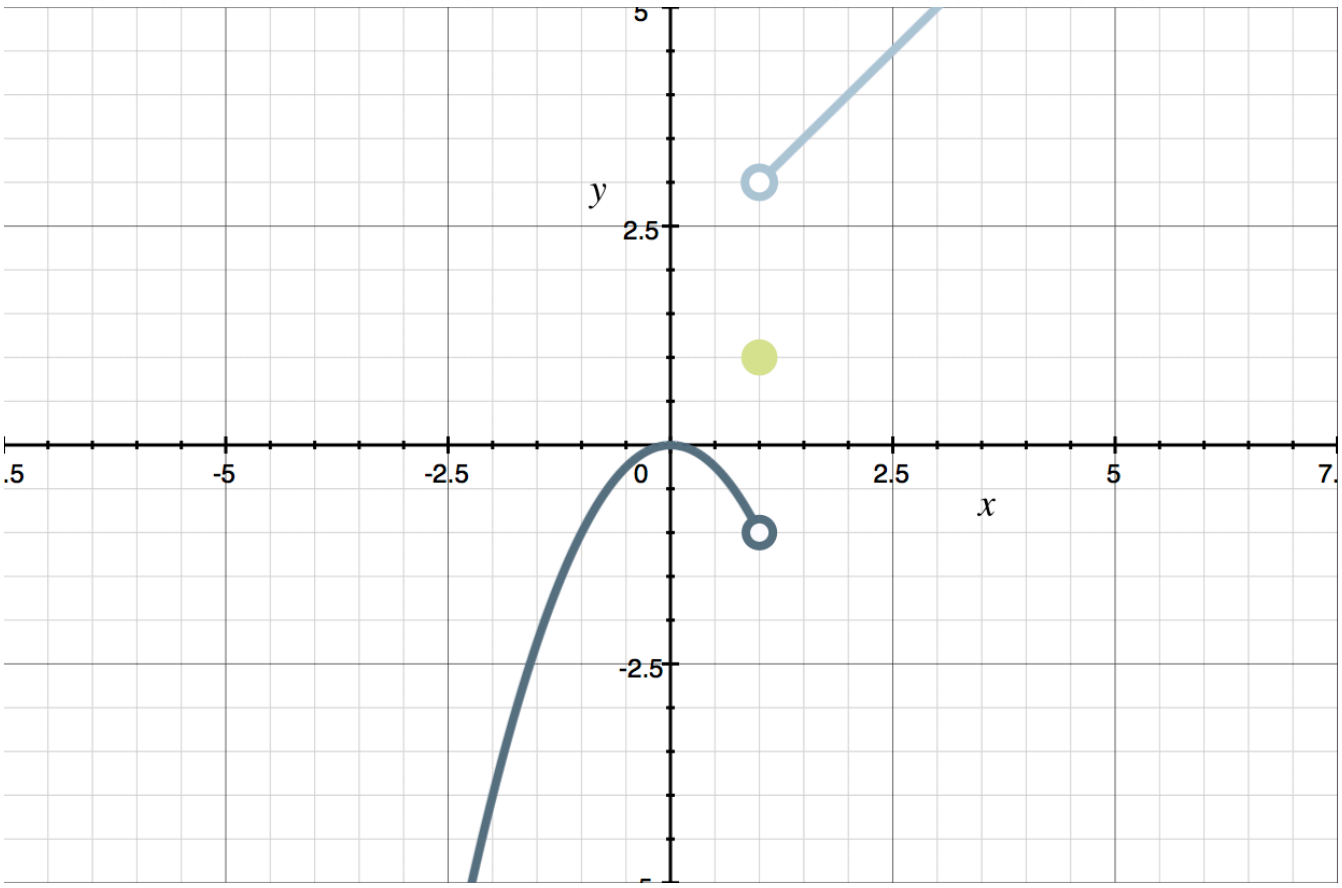


3. Find the equation of the piecewise function.



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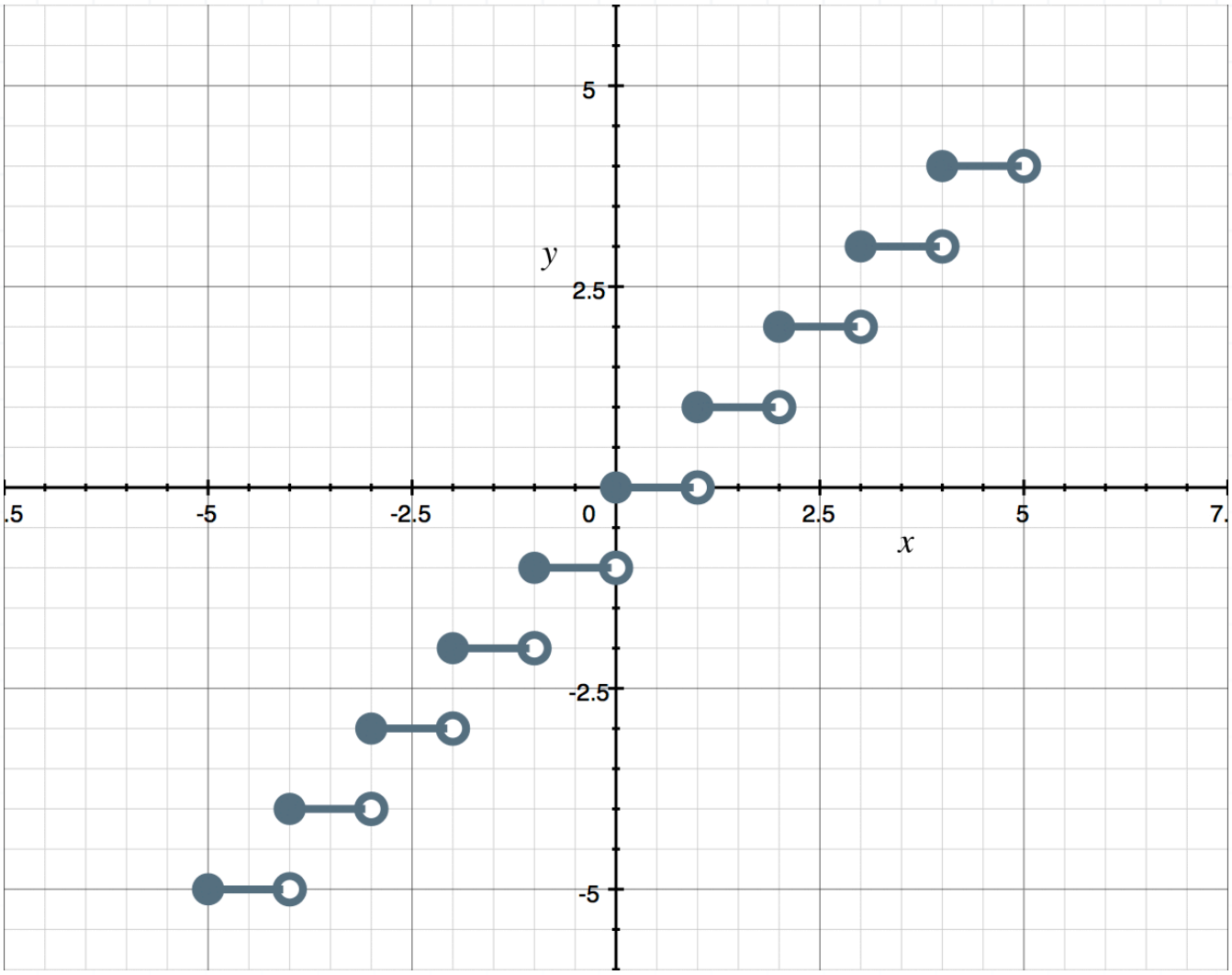
4. Find the equation of the piecewise function.



5. Graph the piecewise function.

$$f(x) = \begin{cases} x^2 & x < -1 \\ \frac{1}{2}x - 3 & x \geq -1 \end{cases}$$

6. Graph the piecewise function.

$$f(x) = \begin{cases} x^2 - 2 & x < 0 \\ 4 & x = 0 \\ -x^2 + 8 & x > 0 \end{cases}$$

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7. Graph the piecewise function.

$$f(x) = \begin{cases} -x + 1 & x < -4 \\ 5 & -4 < x \leq 3 \\ -2x + 11 & x > 3 \end{cases}$$

8. Graph the piecewise function.

$$f(x) = [x]$$

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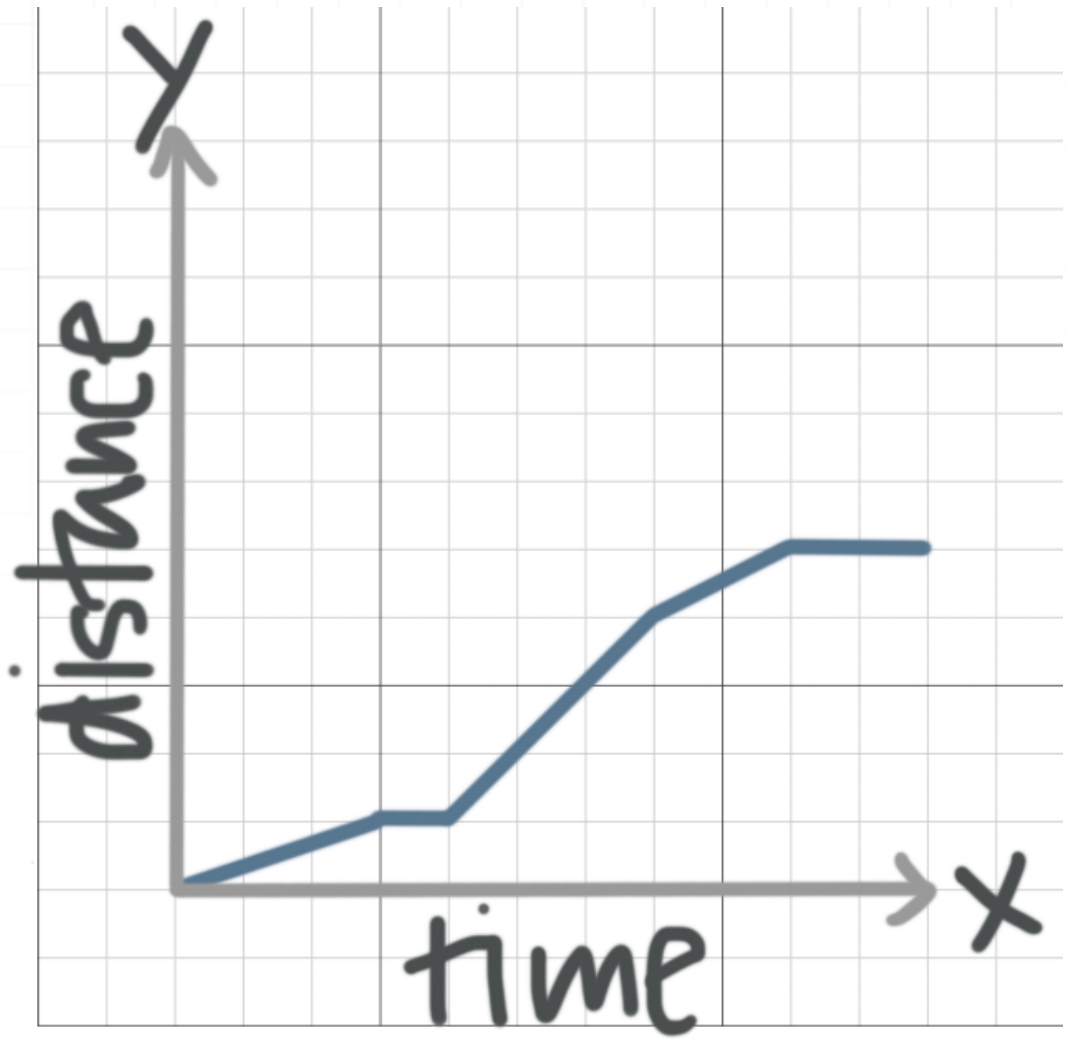
SKETCHING GRAPHS FROM STORY PROBLEMS

1. Alex left in his car to visit his grandparents' house. The graph shows his distance from his house over time. Write a possible story to go along with the graph.



2. A horse is practicing for a race. The graph shows the horse's speed over time. Write a possible story to go with the graph.

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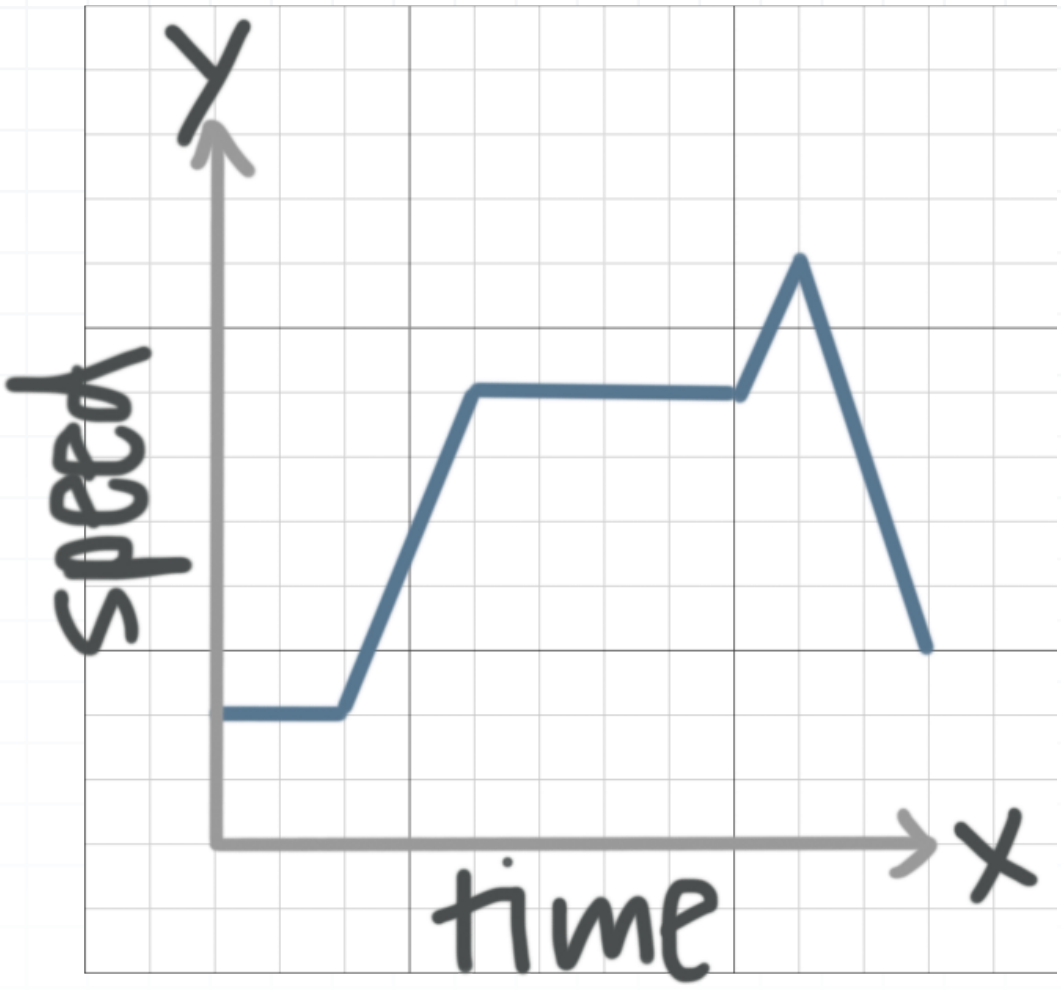

3. A scuba diver takes a dive to explore the ocean. The graph below shows the diver's elevation over time. Write a possible story to go with the graph.

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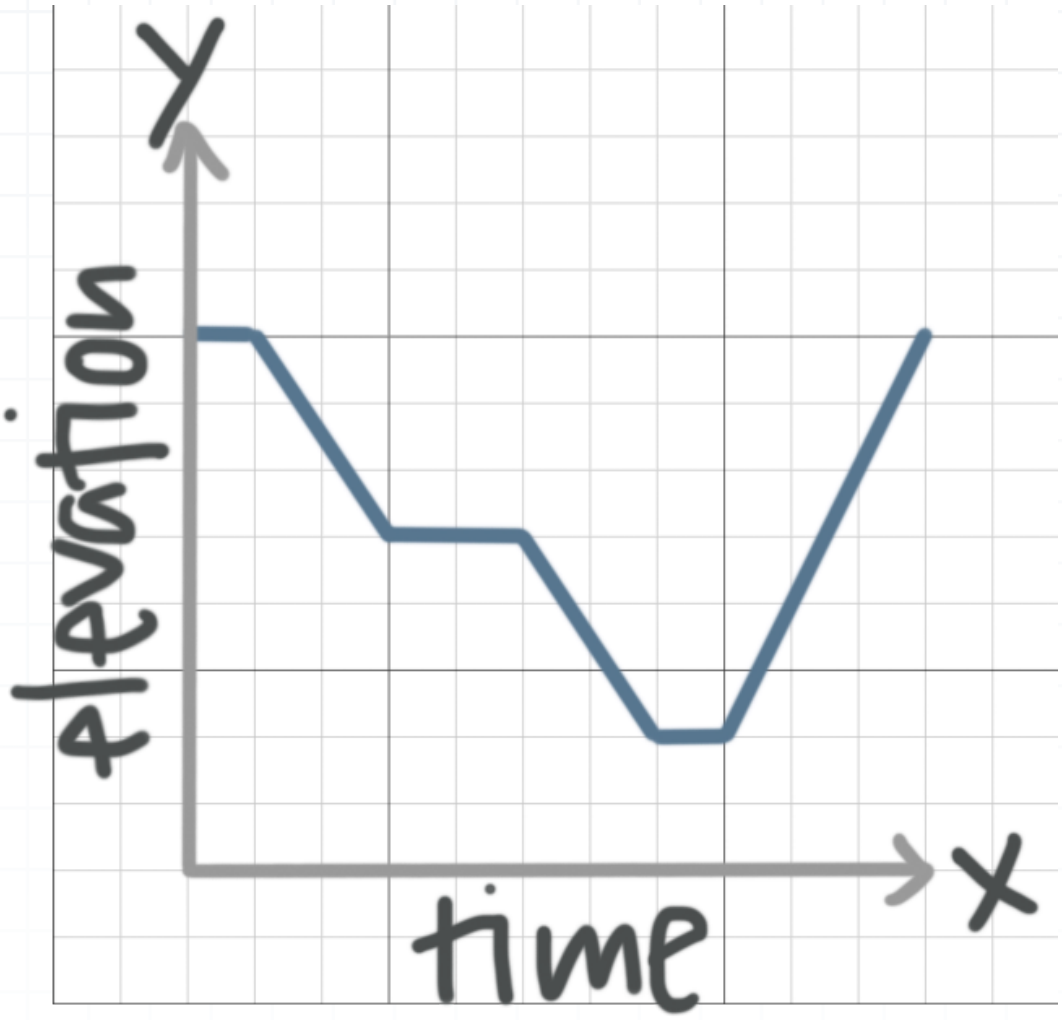

4. Janet delivers packages and get paid an hourly rate in addition to $1 for every package she delivers. The graph shows Janet's pay over the course of the day. Write a possible story to go with the graph.

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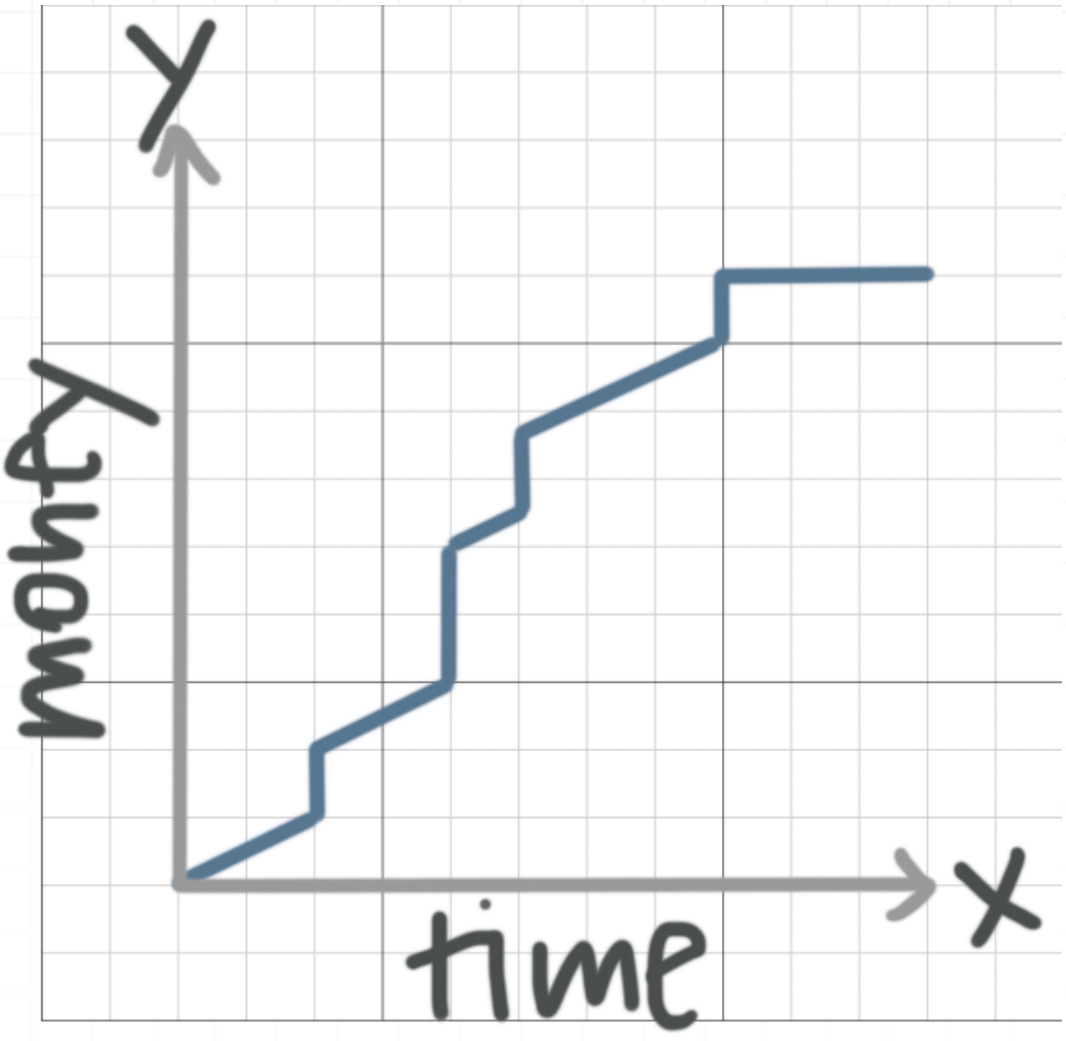

5. A plane takes off and then cruises at $30{,}000$ feet for several hours before rising in elevation to $35{,}000$ feet to avoid turbulence for the last few hours. The plane then reaches its destination and lands. Sketch a graph representing the situation.

6. The temperature throughout a summer day starts at 65° F at 6:00 a.m.. Over the next few hours the temperature rises steadily until it reaches 85° F at 1:00 p.m.. At 1:15 p.m., a rainstorm begins and cools the temperature down to 75° F. The temperature then steadily decreases until it reaches 70° F at 9:00 p.m.. Sketch a graph representing the situation.

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7. Brett goes for a hike up a mountain. He starts hiking up steadily for several hours with two stops for water. Then Brett stops for an hour to eat lunch and rest. He then continues up the mountain, summits, and spends a little time at the top of the mountain before climbing down. Sketch a graph representing Brett's elevation over time.

8. Heather went for a bike ride. She started at 12 mph to warm up, but quickly increased her speed to 20 mph and maintained that speed for most of the ride. Near the end of her bike ride, Heather decreased her speed to 15 mph until she reached her destination. Sketch a graph representing Heather's speed over time.

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EQUATION OF A LINE IN POINT-SLOPE FORM

1. Find the equation of the line that passes through $(3,0)$ with slope -2.

2. Name two (of four possible) pieces of information about a line that are required to write an equation of the line in point-slope form.

3. Find the equation of the line that passes through the points $(-2,3)$ and $(2,-4)$.

4. Find the equation of the line that passes through $(-2,-5)$ with a slope 6.

5. Identify the point (x_1, y_1) and slope m in the equation of the line.

$$y + 3 = \frac{1}{4}(x - 6)$$

6. Write the following equation in point-slope form.

$$y = -\frac{1}{2}x + 4$$

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7. Find the equation of the line that passes through the points $(5, -4)$ and $(6,0)$.

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EQUATION OF A LINE IN SLOPE-INTERCEPT FORM

1. Find the equation of a line through the point $(0,5)$ with slope -2. Write the solution in slope-intercept form.

2. Identify the y-intercept and slope m defining the line.

$$y = -\frac{1}{4}(x + 12)$$

3. Convert the following point-slope equation into a slope-intercept equation.

$$y - 3 = \frac{1}{3}(x - 6)$$

4. Find the equation of a line that passes through the points $(1, -1)$ and $(0,3)$. Write the solution in slope-intercept form.

5. Determine the y-intercept of a line with slope -3 that passes through the point $(1,1)$. Write your solution as a coordinate point.

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6. Name two (of four possible) pieces of information about a line that are required to write an equation of the line in point-slope form.

7. Find the equation of a line that passes through the points $(-3, -2)$ and $(2, -4)$. Write the solution in slope-intercept form.

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GRAPHING PARABOLAS

1. Write the equation in vertex form.

$$y = x^2 + 8x + 5$$

2. Write the equation in vertex form.

$$y = -2x^2 + 24x - 68$$

3. Find the vertex and axis of symmetry of $y = x^2 + 5x + 6$.

4. Find the vertex and axis of symmetry of $y = 3(x + 2)^2 + 6$.

5. Identify the vertex and axis of symmetry from the graph of the parabola.

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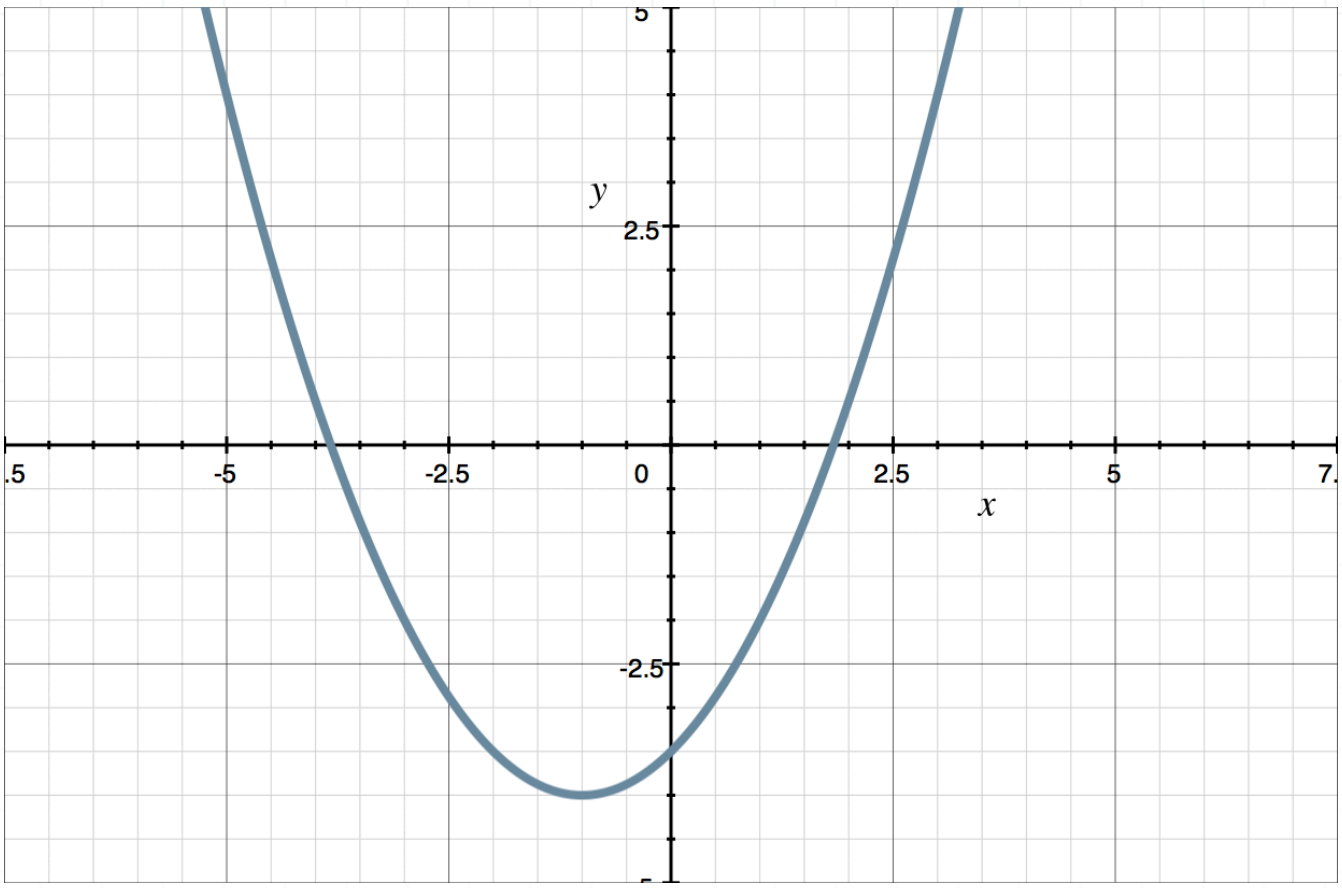
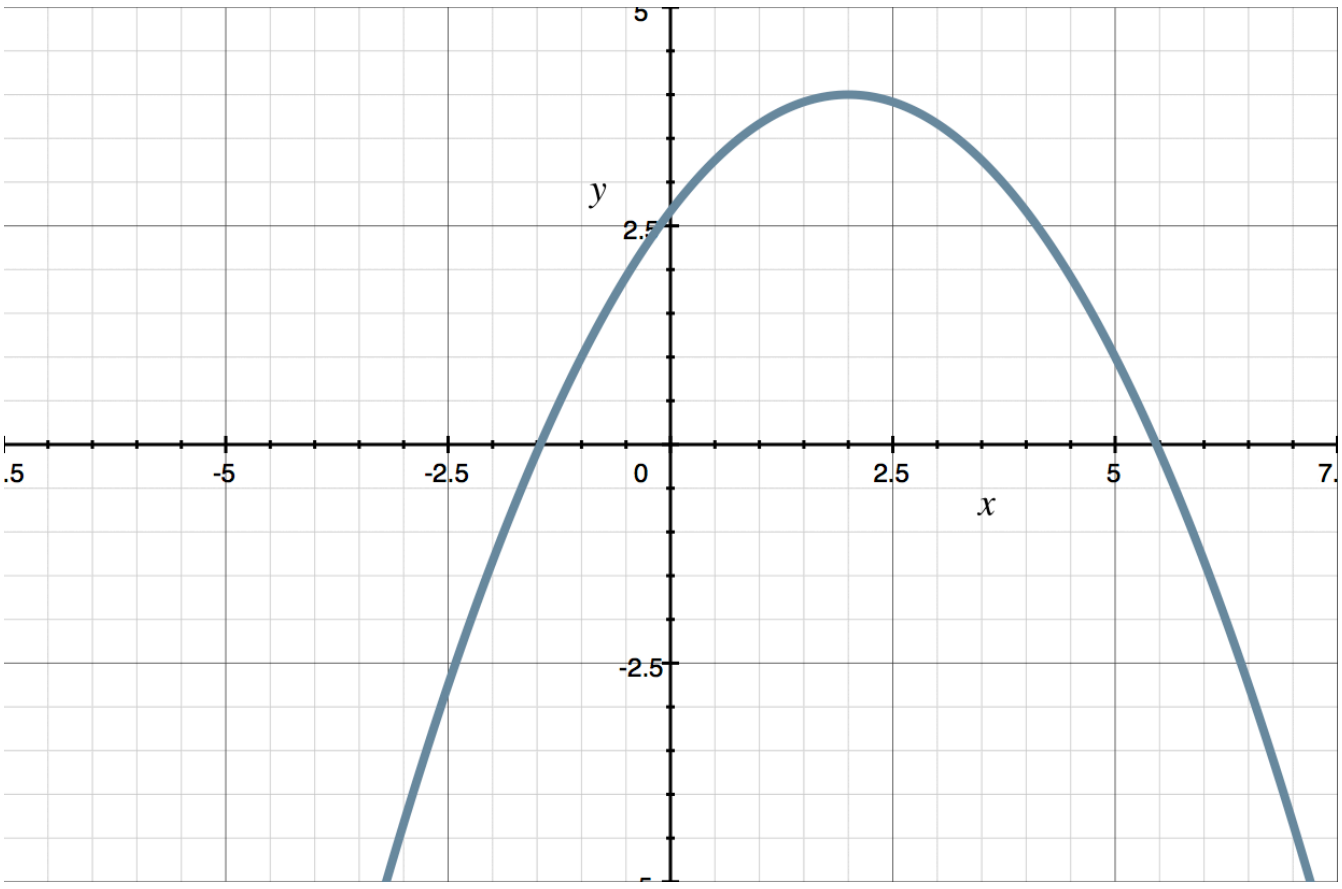


6. Using the graph below, find the equation of the parabola in standard form.



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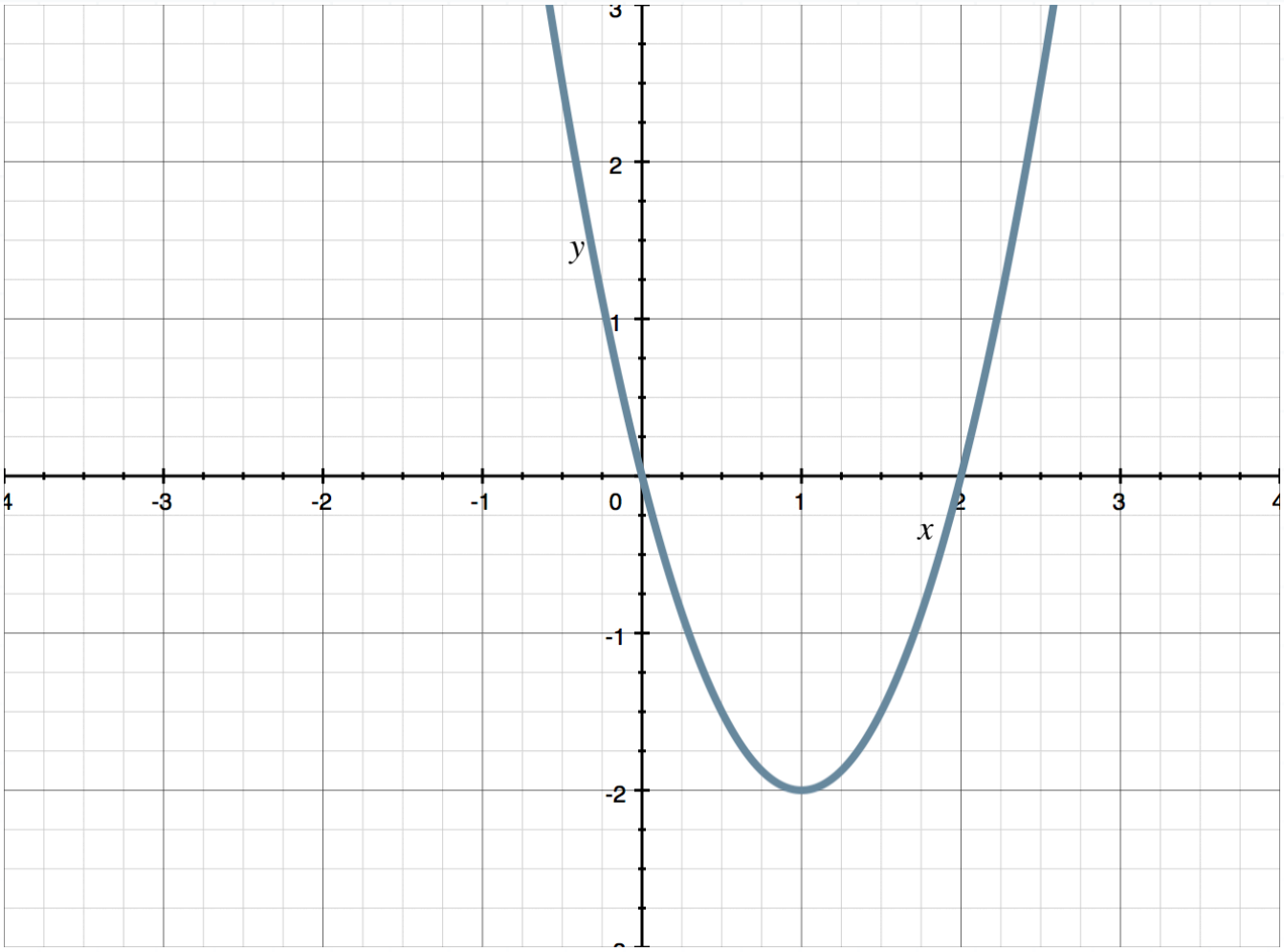
7. Using the graph, find the equation of the parabola in standard form.



8. Complete the square to graph the parabola $y = x^2 + 6x + 5$.

9. Complete the square to graph $y = -x^2 - 4x - 6$.

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FINDING CENTER AND RADIUS OF A CIRCLE

1. Find the center and radius of the circle.

$$x^2 + y^2 - 2x - 3 = 0$$

2. Find the center and radius of the circle.

$$x^2 + y^2 + 14x + 22y + 145 = 0$$

3. Find the center and radius of the circle.

$$16x^2 + 16y^2 - 8x - 24y - 150 = 0$$

4. Find the center and radius of the circle.

$$4x^2 + 4y^2 + 32x - 4y + 41 = 0$$

5. Find the center and radius of the circle.

$$9x^2 + 9y^2 - 30x - 6y - 118 = 0$$

6. Find the center and radius of the circle.

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$$x^2 + y^2 + 4x - 2y = 0$$

7. Find the center and radius of the circle.

$$x^2 + y^2 - 12x + 10y - 3 = 0$$

8. Find the center and radius of the circle.

$$x^2 + y^2 - \frac{1}{4} = 0$$

9. Find the center and radius of the circle.

$$16x^2 + 16y^2 + 96x - 160y + 543 = 0$$

10. Find the center and radius of the circle.

$$9x^2 + 9y^2 - 72x + 12y - 77 = 0$$

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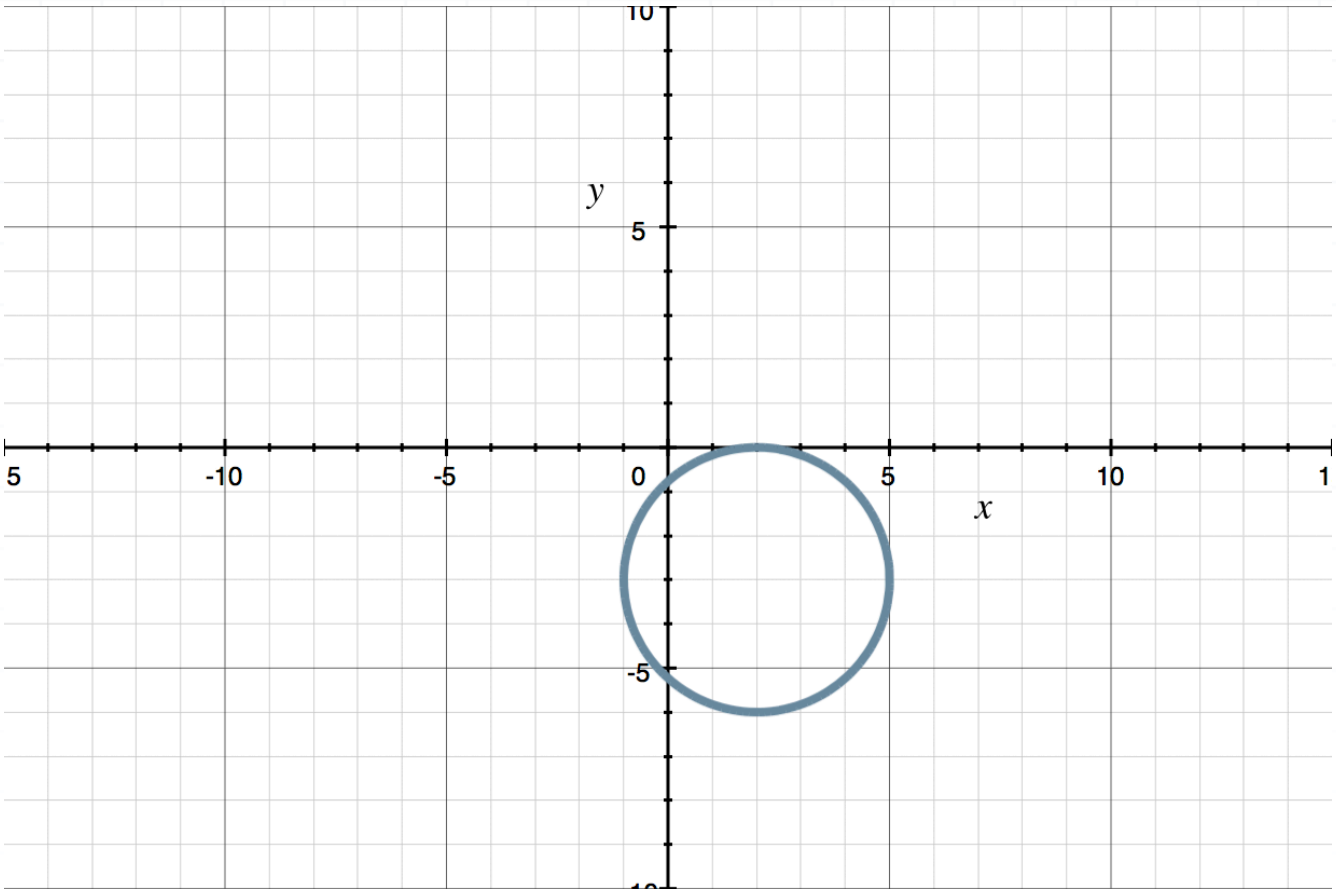
GRAPHING CIRCLES

1. Find the equation of the circle.



2. Find the equation of the circle.

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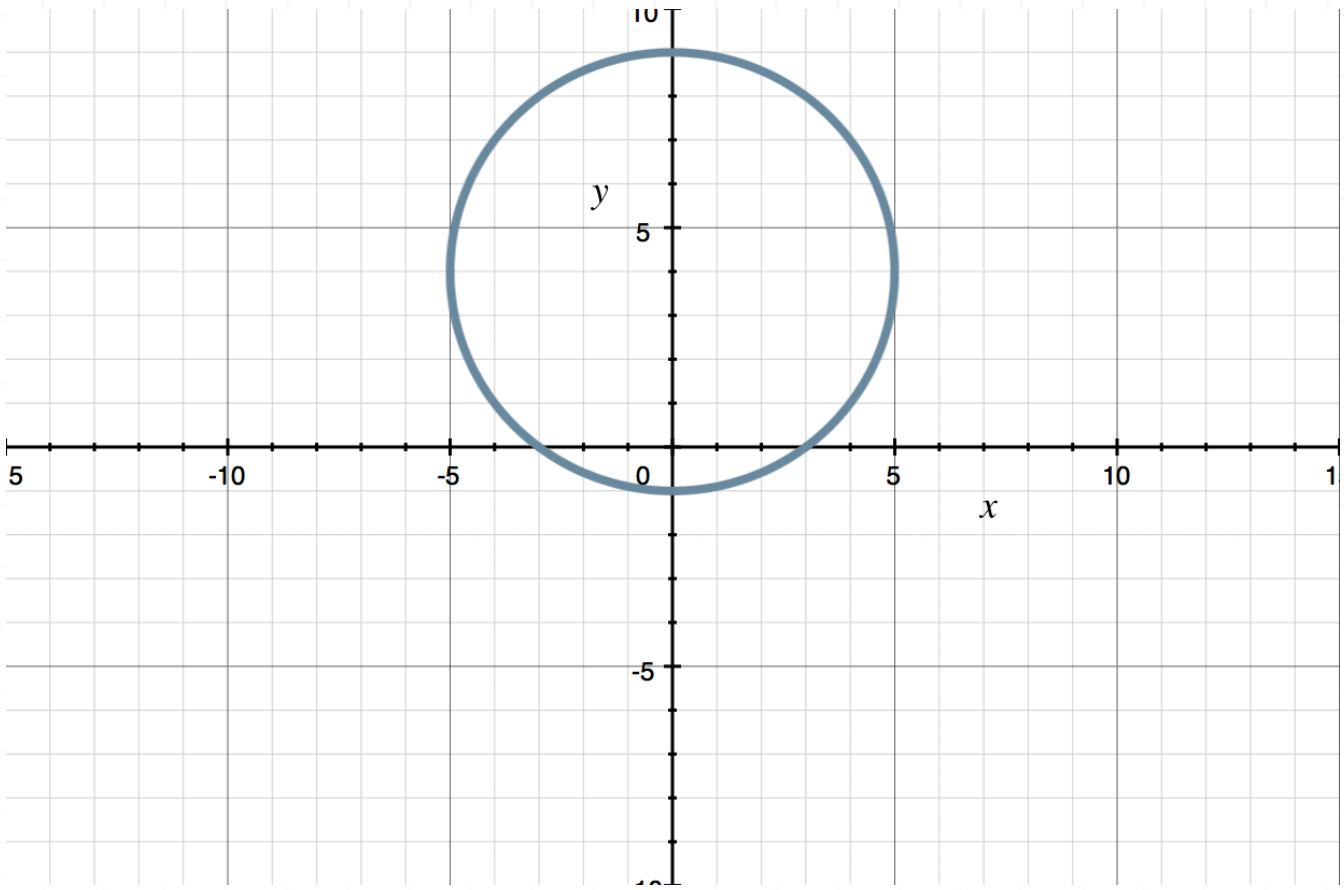

3. Graph the circle $(x-1)^2+(y-2)^2=4$.

4. Graph the circle $(x+3)^2+(y-4)^2=25$.

5. Graph the circle $x^2+(y-3)^2=16$.

6. Graph the circle $x^2+y^2+2x+2y-14=0$.

7. Graph the circle $x^2+y^2-8x-4y+11=0$.

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8. Graph the circle $x^2 + y^2 + 6x - 8y - 11 = 0$.

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